

We claim:

- 1 1. A method for generating a table of contents for a document using only information in
2 said document, comprising the steps of:
 - 3 building a model of said document including an initial semantic structure;
 - 4 detecting changes in said semantic structure spanning different scales; and
 - 5 ordering said changes into entries in said table of contents based on scale span.
- 1 2. The method of claim 1 wherein said table of contents is a hierarchical sequential
2 description of topic changes in said document.
- 1 3. The method of claim 1 wherein said document includes at least one of the following:
2 a text file, an audio file, a video file, a multimedia presentation.
- 1 4. The method of claim 3 wherein said audio file includes music.
- 1 5. The method of claim 3 wherein said audio file includes speech.
- 1 6. The method of claim 3 wherein said text file is an audio transcript.
- 1 7. The method of claim 3 wherein frames in said video file are modeled by a number
2 representing color intensity data.

1 8. The method of claim 3 wherein said model combines audio data and video data into a
2 single unified document representation.

1 9. The method of claim 8 wherein said video data is scaled to have similar influence in
2 said model as said audio data.

1 10. The method of claim 1 wherein said building step comprises the further steps of:
2 defining a vector of terms occurring in said document; and
3 mapping said document into a vector space by projecting scaled term occurrence
4 histogram data onto said vector of terms.

1 11. The method of claim 10 wherein said terms include at least one of: words, phrases,
2 sentences, paragraphs, shots in video data.

1 12. The method of claim 11 wherein said terms are locally and globally weighted.

1 13. The method of claim 12 wherein said local weighting includes the log of term
2 frequency plus one, and said global weighting includes term frequency entropy
3 weighting.

1 14. The method of claim 10 wherein said mapping step includes the further step of
2 summarizing said terms using singular-value decomposition.

1 15. The method of claim 1 wherein said detecting step comprises the further steps of:
2 applying successively smaller scale filter windows to said model according to said
3 initial semantic structure to construct a map of said changes versus scale;
4 identifying local peaks in said contour map, said peaks being points of maximum
5 vector derivative magnitude;
6 tracing said local peaks back to a semantic structure change origin point; and
7 measuring a span of scales over which each said change exists.

1 16. The method of claim 15 wherein said filter windows are Gaussian.

1 17. A system for generating a table of contents for a document using only information in
2 said document, comprising:
3 means for building a model of said document including an initial semantic
4 structure;
5 means for detecting changes in said semantic structure spanning different scales;
6 and
7 means for ordering said changes into entries in said table of contents based on
8 scale span.

1 18. A computer program product comprising a machine-readable medium having
2 computer-executable program instructions thereon for generating a table of contents for a
3 document using only information in said document, including:

4 a first code means for building a model of said document including an initial
5 semantic structure;

6 a second code means for detecting changes in said semantic structure spanning
7 different scales; and

8 a third code means for ordering said changes into entries in said table of contents
9 based on scale span.